IMPLEMENTING ARRANGEMENT

BETWEEN

THE DEPARTMENT OF ENERGY

AND

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

REGARDING THE

ALPHA MAGNETIC SPECTROMETER IN SPACE PROGRAM

Pursuant to the policy established in the Memorandum of Understanding regarding Energy-Related Civil Space Activities between DOE and NASA dated July 9, 1992, this Implementing Arrangement establishes the roles and responsibilities of the Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA) (also referred to collectively as "the Parties" and individually as "the Party") with respect to the Alpha Magnetic Spectrometer in Space (AMS) Program.

I. PROGRAM DESCRIPTION

The AMS is a state-of-the-art particle physics detector containing a large permanent magnet that will be designed, constructed, and tested by an international team organized under DOE sponsorship and that will use the unique environment of space to advance knowledge of the universe and lead potentially to a clearer understanding of the origin of the universe. Specifically, the science objectives of the AMS are to search for cosmic sources of anti-matter (i.e., anti-helium or heavier elements) and dark matter.

The NASA-DOE activities will consist of: (1) the DOE-sponsored design, construction, and testing of the AMS and (2) NASA's provision of two flights of the AMS in space. On the first flight, NASA will install the AMS in the Shuttle cargo bay and will launch and operate the AMS as an attached cargo-bay payload for a brief period, nominally 100 hours cumulative. This will be primarily a science and engineering flight that will enable the development team to gather data on background sources, adjust operating parameters, and verify the detector's performance under actual space flight conditions. On the second flight, NASA will launch the AMS on the Shuttle and transfer and install it onto the International Space Station (ISS). The AMS then will be operated as an externally attached payload on the ISS for a nominal three-year period, after which NASA will detach the AMS from the ISS, transfer it to a Space Shuttle, and return it to Earth. Technical details of the program, including a program schedule, are set forth in Annex 1. As the program matures the Annex will be updated by the points of contact identified in Article IV.

II. AUTHORITY

This Implementing Arrangement is carried out within the statutory guidelines of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.) and the National Aeronautics and Space Administration Act of 1958, as amended (42 U.S.C. 2451 et seq.), and related statutes.

III. RESPONSIBILITIES

The Parties agree to use all reasonable efforts to meet the following agreed roles and responsibilities with respect to the AMS Program, as further detailed in Annex 1.

A. NASA

The NASA Headquarters Office of Life and Microgravity Science and Applications is responsible for the overall NASA management of the AMS Program interface activity between NASA and DOE and for overall program management of the NASA activities required to support the implementation of the AMS flights. The Mission Management Office (MMO) at the Lyndon B. Johnson Space Center (JSC) has been delegated responsibility for implementing the AMS Program for the NASA Office of Life and Microgravity Science and Applications. The MMO will serve as the AMS representative and will act as the single point of contact between the AMS Program and the Shuttle and ISS Programs. The MMO will report and be responsible directly to NASA Headquarters and will be the AMS NASA representative to all other NASA organizations providing equipment, materials, and services for the AMS Program.

In order to implement the AMS Program, NASA will perform or provide the following responsibilities:

1. Fly the AMS as an attached cargo-bay payload on a Shuttle precursor flight. NASA will provide the Shuttle flight, payload accommodation and accommodation engineering, and all necessary AMS-to-carrier integration services.

2. Fly the AMS on the ISS as an externally attached payload, and provide accommodation on the ISS; all necessary services, including AMS-to-carrier integration, AMS transfer to and installation on the ISS, and subsequent transfer of the AMS from the ISS to a Shuttle flight approximately 3 years later for return of the AMS to the Earth-landing site. NASA shall include the AMS in the Space Station utilization planning process.

3. Provide mission-peculiar interface hardware and software for the AMS on the Shuttle precursor flight.

4. Provide mission-peculiar interface hardware and software for the AMS on the ISS flight.

5. Perform AMS-to-carrier integration support, payload certification, and payload safety certification for the Shuttle precursor flight and the ISS flight.

6. Provide necessary facilities and perform related services for AMS final assembly, testing and check-out at the launch site, as well as control center accommodations for AMS operation and monitoring as required for the Shuttle precursor flight and for the launch and ISS transfer phases of the ISS flight.

7. Provide AMS housekeeping, science (unprocessed) and carrier-ancillary data products (e.g. STS state vector, timing) to the DOE-sponsored team at the designated NASA data handling/distribution center.

8. Perform a mission-management function consisting of the following tasks in support of AMS:

a. Representation of the AMS to the Shuttle Program, the ISS Program and to the various supporting NASA organizations involved in the integration and flight of the AMS.

b. Design and operations consultation and guidance to the AMS Program to minimize the potential for incorporation into the AMS design of features or characteristics which could result in functional and/or safety incompatibilities with either the Shuttle or the ISS or with ground systems at the launch or landing sites.

c. Performance of detailed engineering analyses (e.g., stress, loads, etc.) to ensure compatibility of the AMS with the Shuttle and ISS through its launch, operational, and return environments.

d. System engineering for the development of mission-peculiar interface hardware and software needed to analytically, physically, and operationally integrate the AMS into the Shuttle and ISS system.

e. Management of the physical integration of the AMS and mission-peculiar interface hardware onto Shuttle and ISS carriers.

f. Guidance, identification and control of hazards, and lead role in development of Safety Compliance Documentation, and representation of the AMS to the Shuttle, ISS, and John F. Kennedy Space Center (KSC) Safety Panels.

g. Guidance in the development of requirements leveled on the Shuttle and ISS and lead role in negotiation of these requirements through the Shuttle Payload Integration Plan (PIP), the ISS PIP, the associated annexes, and required Interface Control Documents (ICDs).

h. Provision of training related to Shuttle and Station Operations, including the development of training requirements.

i. Provision of documentation required for payload verification of AMS compliance with Shuttle and ISS program requirements.

j. Representation of the AMS Program at KSC and support of testing, AMS-to-carrier integration, and flight operations.

k. Real-time mission support to AMS for the precursor flight and for the delivery flight to the ISS, through AMS deployment, installation, checkout, and verification of proper operation. Real-time support for the return flight de-integration of AMS from the Shuttle and return of hardware and ground support equipment (GSE) to DOE.

NASA is not responsible for refurbishment and/or reconfiguration of AMS between the Shuttle precursor mission and the ISS mission.

B. DOE

The DOE Headquarters Division of High Energy Physics, under the Department's Office of Energy Research is responsible for the administration of a Cooperative Agreement with the Massachusetts Institute of Technology (MIT) for a basic science program in particle physics. Under this agreement, the MIT Principal Investigator for the AMS Program has organized, and is the Spokesperson for, the AMS International Collaboration, currently consisting of scientists from 37 institutes and universities in nine countries, to implement its part of the AMS project. The DOE or, as appropriate, its MIT Cooperative Agreement AMS Principal Investigator, will be responsible for: the definition, design and development of the AMS hardware and related GSE; delivery to and return from a location to be specified at the Kennedy Space Center for integration or de-integration in the NASA processing system; and establishment of the science mission requirements. These responsibilities will include:

1. All necessary interagency coordination and obtaining necessary concurrences within the U.S. Government for the AMS project regarding international arrangements among the DOE Program Collaborators involved in the definition, design, development, fabrication, assembly, test, checkout, and operation of the AMS.

2. Management of all international transfer and shipment, unless otherwise agreed. This includes, but is not limited to, customs clearances, import and export licenses required for AMS systems, subsystems, or components, or, as mutually agreed, for any NASA tests, integration, or mission-peculiar equipment or technical data that is required to be shipped abroad.

3. Establishment of the AMS science plan, including science requirements, definition of data requirements, and definition of mission success criteria.

4. Provision, when requested by NASA, of DOE technical and management support for all formal NASA reviews involving AMS (Safety Reviews, Cargo Integration Reviews, Ground Operations Reviews, Flight Operations Reviews, etc.) and other related NASA reviews or activities.

5. Development and management of an AMS implementation schedule consistent with NASA program milestone schedules and provision of updates to keep NASA advised of AMS schedule status.

6. Provision of technical and management data required by NASA to complete programmatic requirements, e.g., Safety, Interface Control Documents (ICD), PIP, PIP Annexes, reviews, material lists, etc.)

7. Provision of all transport equipment (shipping containers, other AMS handling ground support equipment) required for AMS transport to and from NASA KSC.

8. Management of: (1) All AMS science and engineering team activities, including travel, visa issuances, and related in-country logistical expenses; (2) support for science operations before, during, and after AMS flights; and (3) science data analysis, distribution, and publication.

IV. POINTS OF CONTACT

The points of contact for activities under this agreement are:

For NASA-
Dr.Edmond M. Reeves
Director, Flight Systems Division
Office of Life and Microgravity Sciences and Applications
NASA Headquarters
Washington, DC 20546

Electronic Mail - ereeves@hq.nasa.gov

For DOE-
Dr. Wilmot N. Hess
Associate Director of the Office of Energy Research for High Energy and Nuclear Physics
ER-20/GTN
U.S. Department of Energy
19901 Gemantown Road
Germantown,MD 20874-1290

Electronic Mail - Wilmot.Hess@oer.doe.gov

The points of contact for programmatic, technical, and schedule issues are:

For NASA-
Mr. Mark Sistilli
AMS Program Manager
Flight Systems Division
Office of Life and Microgravity Sciences and Applications
NASA Headquarters
Washington, DC 20546

Electronic Mail - msistilli@hq.nasa.gov

For DOE-
Dr. John R. O'Fallon
Director, Division of High Energy Physics
ER-22/GTN
U.S. Department of Energy
Germantown, MD 20874-1290

Electronic Mail - John.OFallon@oer.doe.gov

V. EXCHANGE OF TECHNICAL DATA AND GOODS

Each Party is obligated to transfer to the other Party only those technical data and goods necessary to fulfill its responsibilities under this Agreement, subject to the following:

1. Interface, integration, and safety data (excluding detailed design, manufacturing, and processing data, and associated software) will be exchanged by the Parties without restrictions as to use or disclosure.

2. In the event a Party finds it necessary in carrying out its responsibilites under this Agreement to transfer technical data other than that specified in paragraph 1 above that are proprietary, and for which protection is to be maintained, such technical data will be marked with a notice indicating that it shall be used and disclosed by the receiving Party and its contractors and subcontractors only for the purposes of fulfilling the receiving Party's responsibilities under this agreement, and that the technical data shall not be disclosed or retransferred to any other entity without prior written permission of the furnishing Party. The receiving Party agrees to abide by the terms of the notice, and to protect any such marked technical data from unauthorized use and disclosure.

3. In the event a Party finds it necessary in carrying out its responsibilities under this Agreement to transfer technical data and goods that are to be protected for export control purposes, the furnishing Party shall mark with a notice or otherwise specifically identify such technical data or goods. The notice or identification shall indicate that such technical data and goods shall be used and such technical data shall be disclosed by the receiving Party and its contractors and subcontractors only for the purposes of fulfilling the receiving Party's responsibilities under the Agreement. The notice or identification shall also provide that such technical data shall not be disclosed, and such technical data and goods shall not be retransferred, to any other entity without prior written permission of the furnishing Party. The Parties agree to abide by the terms of the notice or identification and to protect any such marked technical data and identified goods.

4. The Parties are under no obligation to protect any unmarked technical data or unidentified goods.

5. Nothing in this Agreement requires the Parties to transfer technical data and goods contrary to national laws or regulations relating to export controls or control of classified data.

VI. PATENTS AND INVENTION RIGHTS

Unless otherwise agreed by the Parties, custody and administration of inventions made as a consequence of, or in direct relation to, the performance of activities under this Agreement will remain with the respective inventing Party. In the event an invention is made jointly by employees of the Parties or their contractors or by an employee of a Party's contractor, the Parties will consult and agree as to future actions toward establishment of patent protection for the invention.

VII. AUTHORIZATION, CONSENT AND INDEMNIFICATION

DOE shall ensure that the DOE/MIT cooperative agreement contains Authorization and Consent clause, 48 CFR 52.227-1 (Alternate 1),and Patent Indemity clause, 48 CFR 52.227-3.

VIII. RESULTING DATA

In accordance with applicable laws, regulations,and NASA science policy, scientific data derived from the AMS payload will be made publicly available in a useable form as quickly as possible. To this end, all appropriate data products will be deposited with the National Space Science Data Center or its equivalent organization (hereafter referred to as NSSDC) in the following manner:
- AMS data archiving will be in accordance with mutually agreed science policy goals and schedules associated with the early data reduction of different types of AMS scientific data as described in the NASA/DOE Science Archiving Plan for AMS.
- AMS data used to support any publication(s) prior to the completion of on-orbit AMS science operations and/or the return of AMS to Earth after its flight on the international Space Station will be deposited in the NSSDC concurrent with publication.
- The full AMS data will be deposited in the NSSDC within one year of the completion of on-orbit AMS science operations and the return of AMS to Earth after its flight on the international Space Station.

In general, results of experiments will be made available to appropriate journals or other established channels as soon as practicable, consistent with good scientific practice. In the event such reports or publications are copyrighted, NASA and DOE shall have a royalty-free right under the copyright to reproduce, distribute and use such copyrighted work for their purposes.

DOE shall ensure that the provisions of this article are made applicable to the MIT Cooperative Agreement Investigators.

IX. FINANCIAL ARRANGEMENTS

The Parties shall each bear the costs of discharging their respective responsibilities under this Implementing Arrangement, unless otherwise mutually agreed. This Implementing Arrangement shall not be used to obligate or commit funds or as the basis for the transfer of funds.

The ability of the Parties to carry out their respective responsibilities under this Implementing Arrangement shall be subject to the availability of appropriated funds. Should either Party encounter financing problems, that Party shall notify the other Party thereof in a timely manner.

X. PUBLIC INFORMATION

Release of public information regarding the AMS program may be made by the appropriate Agency for its own portion of the program and, insofar as participation of the other is involved, after suitable consultation.

XI. LIABILITY

DOE acknowledges that a requirement of flight on the Shuttle or participation in the ISS is that it waive all claims for damage to its property or injury or death of its employees. This waiver includes claims against any of NASA's Shuttle contractors or subcontractors or other NASA Shuttle customers or users. In addition, participation in ISS activities requires a similar waiver against all ISS partners and their related entities. The terms of the required cross-waiver are contained in Annex 2 to this Implementing Arrangement. Consistent with this requirement, DOE, in signing this Implementing Arrangement, agrees to extend the cross-waiver, by contractual provision or otherwise, to its AMS Program collaborators.

XII. REGISTRATION OF THE AMS WHEN ATTACHED TO ISS

The AMS payload, when attached to ISS, shall be considered a U.S. payload and NASA will notify the State Department so that, if required, the AMS can be registered in accordance with the Convention on Registration of Objects Launched into Outer Space .

XIII. AMENDMENT

This Implementing Arrangement may be modified or amended by written agreement between the Parties and may be terminated by mutual agreement or by either Party following 120 days written notice to the other Party.

XIV. ENTRY INTO FORCE AND DURATION

This Implementing Arrangement shall enter into force on the date of the last signature hereon and shall remain in force for the earlier of (1) completion of all activities under this agreement (2) or a period of ten (10) years from the effective date, unless earlier terminated.

By _____
Associate Administrator
for Life and Microgravity
Sciences and Applications
National Aeronautics and
Space Administration

Date: 20 Sept 95

By _____
Director
Office of Energy Research
Department of Energy

Date: Sept. 20, 1995

ANNEX I

Program Technical Description:

The purpose of this Annex is to categorize in general terms the basic technical characteristics of the AMS payload for the space flights as described in Article I, Program Description. Although these general AMS technical characteristics are approximate, they provide a mutually controlled reference categorization of the AMS. It should be noted that these technical characteristics pertain to the AMS payload only and do not include NASA-provided mission-peculiar interface hardware, carriers, and carrier support structure.

AMS:	AMS flight on Space Shuttle	AMS flight to ISS
Mass (lbs)	6900	7200
Volume (ft3)	200	280
Maximum Power (kw)	1.0	1.0
Maximum Data Generation Rate (MBPS)	1.0	1.0

Program Schedule:

- AMS flight on Space Shuttle - STS-90, currently scheduled for 4/1998.
- AMS flight to ISS - utilization flight-4, currently scheduled for 2/2001.

ANNEX 2

1. The objective of this Annex is to establish a cross-waiver of liability by the Parties and related entities in the interest of encouraging participation in the exploration,exploitation and use of outer space. This cross-waiver of liability shall be broadly construed to achieve this objective.

2. For the purposes of this Annex:

(a) A "Partner State" means each contracting Party for which the Government of the United States of America,Governments of Member States of the European Space Agency, the Government of Japan, and the Government of Canada on Cooperation in the Detailed Design, Development,Operation,and Utilization of the Permanently Manned Civil Space Station"(hereinafter the "Intergovernmental Agreement), as amended, has entered into force, in accordance with Article 25 of the Intergovernmental Agreement. A Partner State includes its Cooperating Agency. It also includes the National Space Development Agency of Japan

(b) The term "related entity" means:

1. a contractor, subcontractor or financial assistance recipient of a Party or a Partner State at any tier;
2. a user or customer of a Party or a Partner State at any tier; or
3. a contractor, or subcontractor or financial assistance recipient of a user or customer of a Party or a Partner State at any tier.

The term "related entity" includes another State or an agency or institution of another State, where such State, agency or institution is an entity as described in (1) through (3) above or is otherwise involved in the activities undertaken pursuant to this IA. The terms "contractors" and "subcontractors" include suppliers of any kind.

(c) The term "damage", means:

1. bodily injury to, or other impairment of health of, or death of, any person;
2. damage to, loss of, or loss of use of any property;
3. loss of revenue or profits; or
4. other direct, indirect, or consequential damage.

(d) The term "launch vehicle" means an object(or any part thereof) intended for launch, launched from Earth, or returning to Earth which carries payloads or persons, or both.

(e) The term "payload" means all property to be flown or used on or in a launch vehicle or the ISS.

(f) The term "Protected Space Operations" means all launch vehicle activities, ISS activites, and payload activities on Earth, in outer space, or in transit between Earth and outer space done in implementation of this Implementing Arrangement. It includes, but is not limited to:

1. research, design, development, test, manufacture, assembly, integration, operation, or use of launch or transfer vehicles, the ISS, or a payload, as well as related support equipment, and facilities and services;

2. all activites related to ground support, test, training, simulation, or guidance and control equipment, and related facilities or services.

"Protected Space Operations" excludes activities on Earth which are conducted on return from space or from the ISS to develop further a payload's product or process for use other than for ISS-related activites in implementation of this Agreement.

3. (a) Each Party agrees to a cross-waiver of liability pursuant to which each Party waives all claims against any of the entities or persons listed in paragraphs 3(a)(1.) through 3(a)(4) of this paragraph based on damage arising out of Protected Space Operations. This cross–waiver shall apply only if the person, entity, or property causing the damage is involved in Protected Space Operations and the person,entity, or property is damaged by virtue of its involvement in Protected Space Operations. The cross-waiver shall apply to any claims for damage, whatever the legal basis for such claims, including but not limited to delict and tort (including negligence of every degree and kind) and contract, against:

1. the other Party;
2. a Partner State other than the United States of America;
3. a related entity of any entity identified in subparagraphs 3(a)(1) or 3(a)(2) above;
4. the employees of any entity identified in subparagraphs 3(a)(1) or 3(a)(2) above;

(b) In addition, each Party shall extend the cross-waiver of liability as set forth in paragraph 3(a) of this section to its own related entities by requiring them, by contract or otherwise, to agree to waive all claims against the entities or persons identified in sub-paragraphs 3 (a)(1) or 3 (a)(2) of this annex.

(c) For avoidance of doubt, this cross-waiver of liability includes a cross-waiver of liability arising from the Liability Convention where the person,entity, or property causing the damage is involved in Protected Space Operations, and the person, entity, or property damaged is damaged by virtue of its involvement in Protected Space Operations.

(d) Notwithstanding the other provisions of this Annex, this cross-waiver of liability shall not be applicable to:

1. claims between a Party and its own related entities or between its own related entities;
2. claims made by a natural person, his/her estate, survivors, or subrogees for bodily injury, other impairment to health or death of such natural person;
3. claims for damage caused by willful misconduct;
4. intellectual property claims;
5. claims for damage resulting from a failure of the Parties to extend the cross-waiver of liability as set forth in sub-paragraph 2 (b) or from a failure of the Parties to ensure that their related entities extend the cross-waiver of liability as set forth in sub-paragraph 2 (b); or
6. contract claims between the Parties based on the express contractual provisions.

(e) Nothing in this Article shall be construed to create the basis for a claim or suit where none would otherwise exist.